

## REMARKS

Applicants would like to thank Examiner Vinh for conducting an Interview on March 26, 2009 with the undersigned counsel.

The Office Action mailed November 20, 2009, has been received and its contents carefully studied. From the Summary page, claims 16-19 were pending and indicated as rejected.

By this response, claims 16-19 have been amended to positively recite the claimed features of the invention. In addition, new claims 20-23 have been added which are dependent upon claims 16-19, respectively. No statutory new matter has been added. Support for all claim amendments can be found in the disclosure as originally filed.

New claims 20-23 recite a further step of *“forming a thermal oxide film on the surface after removal of the chemical oxide film, whereby the thermal oxide film is the only film on the surface”*. Support can be found in FIG. 2(c).

Further, Applicants submit a Petition for a Two-month Extension of Time herewith.

### ***Rejections Under 35 U.S.C. § 103(a)***

Claims 16-19 stand rejected as being unpatentable over Nishino et al. (US 5,030,319) in view of Song et al. (US 2004/0161890) and further in view of Demmin et al (US 6,635,185). The rejections as to claims 16-19 is traversed.

Claims 16-19 have been amended positively recite the process steps. In particular each of claims 16-19 now recites,

*“A method of removing silicon dioxide films from a surface of a workpiece having a natural oxide film thereon, said method comprising:*  
*removing the natural oxide film from the surface of the workpiece by a chemical process;*  
*forming a chemical oxide film on the surface as a protective film after removal of the natural oxide film, the chemical oxide film being a silicon dioxide film formed by a chemical process using a solution prepared by mixing H<sub>2</sub>O<sub>2</sub> and NH<sub>4</sub>OH; and*  
*removing the chemical oxide film from the surface of the workpiece, under conditions that: ...”*.

Applicants respectfully submit that the combination of Nishino, Song and Demmin fails to teach or suggest all of the features mentioned above. Thus, claims 16-19 patentably distinguish thereover.

The Office Action asserts Nishino as purportedly “removing an oxide layer “after” the removal of a natural oxide film previously existing on a workpiece (col. 15, lines 10-16, col. 16, lines 15-25)”. [Emphasis Added]. Nishino, however, rather than removing the natural oxide, discloses formation of a thin film 52 of  $(\text{NH}_4)_2\text{SiF}_6$  on the native (natural) oxide film 51. See cols. 8-9, lls. 52-16; See also col. 13, ll. 39-60 and FIG. 5b. Film 52 is not a chemical oxide film. Thereafter, both the thin film 52 and the natural oxide film 51 are removed simultaneously via sublimation at about 100 °C. See col. 14, ll. 1-6 and FIG. 5c. Nishino’s objective is to reduce the thin film 52 and natural oxide film 51 simultaneously in order to reduce the sublimation temperature from about 900 °C to about 100 °C. Nishino is not concerned with replacement of a natural oxide later with a chemical oxide layer.

Contrary to Nishino, Applicants’ claims require the complete removal of the natural oxide before formation of a chemical oxide film on the surface of the wafer. Applicants’ claims require formation of a chemical oxide film after natural oxide removal, not a non-oxide film  $(\text{NH}_4)_2\text{SiF}_6$ ). Thereafter, Applicants require removal of a chemical oxide film, as very particularly prescribed in the claims, prior to formation of a thermal oxide film.

By way of review, Applicants’ invention, as exemplified in FIG. 2a discloses chemical oxide film 4 formed on the wafer after removal of natural oxide film 2. In step 2b, the chemical oxide film is removed. Thereafter, in their step 2c Applicants disclose formation of a thermal oxide film on the silicon wafer. By so doing, Applicants can control the thickness of the thermal oxide film very accurately in order to produce a gate oxide film. Nishino can not teach or suggest such to those of ordinary skill in the art because Nishino does not remove the natural oxide but rather forms some other non-oxide compound over top of it prior to removal. Furthermore, Nishino requires two steps to remove his chemical film, *i.e.*, a first step of growing  $(\text{NH}_4)_2\text{SiF}_6$  and then a second step of sublimating the  $(\text{NH}_4)_2\text{SiF}_6$  over the natural oxide, film to remove it and the natural oxide. By contrast, Applicants’ remove their chemical oxide film in only one step by carrying out their introduction of mixed (HF and  $\text{NH}_3$ ) according to their

specific, claimed parameters. Neither Song nor Demmin remedies these fundamental differences between Nishino and Applicants' claimed invention. Therefore, the asserted combination of cited art would not have rendered claims 16-19 *prima facie* obvious to one of ordinary skill in the art. Thus, claims 16-19 continue to patentably distinguish thereover. For at least these reasons, Applicants courteously request withdrawal and reconsideration of the rejections as to claim 16 and claims 17-19.

### CONCLUSION

All of the stated grounds of rejections have been properly traversed, accommodated, or rendered moot. Therefore it is respectfully requested that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for all allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefore are hereby authorized to be charged to Deposit Account No. 02-4300, Attorney Docket No. 033082 M 275.

Respectfully submitted,  
SMITH, GAMBRELL & RUSSELL, LLP

By:



Michael A. Makuch, Reg. No. 32,263  
1130 Connecticut Ave., N.W., Suite 1130  
Washington, D.C. 20036  
Telephone: (202) 263-4300  
Facsimile: (202) 263-4329

Dated: April 20, 2009